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Paul A. Johnsgard

University of Nebraska-Lincoln, pajohnsgard@gmail.com

Rose DiSilvestro

Lincoln, Nebraska

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# Seventy-five years of changes in Mallard — Black Duck ratios in eastern North America

*The Black Duck has exhibited  
an apparent decrease relative to the  
Mallard throughout its range . . .*

*Paul A. Johnsgard\* and  
Rose DiSilvestro\*\**

## INTRODUCTION

One of the most spectacular shifts in waterfowl distribution patterns in North America is the degree to which Mallards (*Anas platyrhynchos*) have come to replace Black Ducks (*Anas rubripes*) as the dominant breeding and wintering species in the eastern half of the United States and Canada over the past several decades. The reasons for these changes in the actual and relative numbers of Mallards and Black Ducks are doubtless many and probably include such factors as man-induced habitat changes, game management practices such as artificial stocking programs and changing hunting regulations, and possibly even climatic trends, but there can be no doubt that the Mallard has successfully colonized many areas which once were almost entirely occupied by Black Ducks, and in some areas has completely replaced that species. The evolutionary consequences of increased contact between the two forms in terms of ecological competition and genetic interchange resulting from hybridization, have yet to be fully understood, but are obviously substantial.

## METHODS AND RESULTS

The long record of Audubon Christmas Bird Counts provides an excellent means of document-

ing these changes, owing to the fact that the entire Black Duck wintering population tends to be concentrated in areas that have been surveyed extensively ever since the counts began, and because wintering Black Ducks and Mallards can be fairly accurately recognized and counted even by amateur observers. Wing's (1943) summary of the first 40 years of Christmas Bird Count data indicated the values of utilizing this source of information long before major changes became apparent, and more recently Johnsgard (1961) summarized the data for the subsequent two-decade period of 1940-1949 and 1950-1959. Shortly thereafter it became possible to compare some of these figures with those obtained by the U.S. Fish and Wildlife Service, and thus additional analyses for the period 1960-1964 have been published (Johnsgard, 1967).

Now that a full 75 years of data have accrued, a short summary of the overall information seems worthwhile, so that persons in areas where changes are occurring most rapidly can be alerted to the situation, and perhaps might undertake more detailed analyses for such regions. With this in mind, the junior author has extracted the

\* School of Life Sciences, University of Nebraska, Lincoln, Neb. 68588

\*\* 837 "E" Street, Lincoln, Neb. 68503

**Table 1**  
**Per cent of Black Ducks in Combined Population**  
**(Sample Size in Parentheses)**

State or Province	1900-1939*	1940-1949	1950-1959	1960-1969	1970-1974
Nova Scotia	—	—	99.97 (5964)	99.89 (6806)	99.96 (8266)
New Brunswick	—	—	100.00 (98)	99.52 (2071)	98.75 (1765)
Québec	—	96.27 (2173)	97.60 (6469)	92.46 (8201)	92.34 (6962)
Maine	—	99.89 (1775)	99.35 (6586)	96.38 (18,171)	94.83 (24,626)
New Hampshire	—	—	97.13 (5962)	76.42 (17,106)	63.08 (10,232)
Vermont	—	96.11 (283)	97.82 (550)	80.53 (6970)	84.20 (1469)
Massachusetts	99.28	98.52 (79,042)	94.37 (124,501)	91.13 (219,999)	83.93 (149,713)
Rhode Island	99.35	99.45 (18,569)	97.86 (19,169)	90.40 (34,822)	86.45 (16,070)
Connecticut	94.31	97.11 (19,975)	74.47 (53,448)	60.02 (149,352)	48.80 (106,056)
New York (entire state)	96.12	90.97 (148,802)	86.90 (233,276)	74.04 (369,263)	62.67 (225,832)
New York (Long Island)	—	94.00 (83,162)	90.15 (139,200)	80.57 (254,612)	73.14 (150,589)
New York (rest of state)	—	87.15 (65,640)	82.09 (94,076)	59.54 (114,651)	41.72 (75,243)
New Jersey	99.17	92.76 (54,297)	88.79 (255,375)	79.78 (286,946)	58.11 (135,531)
Pennsylvania	95.39	86.52 (73,886)	61.83 (146,045)	45.85 (226,713)	24.30 (144,322)
Delaware	99.09	97.17 (22,411)	58.18 (203,664)	52.29 (172,942)	57.28 (76,988)
Maryland	94.08	88.23 (26,417)	62.87 (162,527)	53.14 (175,684)	36.74 (67,898)
Virginia	67.53	85.67 (18,156)	68.74 (99,995)	68.19 (162,248)	66.48 (121,114)
North Carolina	90.13	63.10 (32,655)	49.41 (33,442)	58.09 (91,599)	47.07 (14,444)
South Carolina	71.35	67.84 (4766)	6.04 (52,450)	14.54 (13,105)	38.72 (3140)
Georgia	70.58	66.10 (32,148)	6.96 (2427)	27.42 (4599)	10.70 (4783)
Florida	65.98	29.09 (3042)	21.52 (5306)	26.16 (15,510)	18.85 (4174)
Ohio	66.89	60.32 (56,249)	41.23 (256,252)	39.14 (371,161)	34.77 (240,054)
West Virginia	88.01	94.67 (652)	66.21 (2652)	61.11 (9350)	29.26 (7033)
Kentucky	15.31	42.74 (19,299)	9.60 (415,793)	10.52 (268,176)	29.18 (15,899)
Tennessee	19.54	11.68 (38,321)	1.67 (361,013)	6.87 (685,931)	8.33 (298,407)
Alabama	—	18.02 (23,637)	7.70 (64,744)	14.48 (18,134)	17.38 (57,239)
Mississippi	14.56	7.90 (1205)	0.02 (11,623)	0.90 (22,619)	0.04 (76,409)
Ontario	97.51	86.59	65.36	48.73	22.22

\*Calculated from Wing's (1943) summary, sample sizes not given.

State or Province	1900-1930*	1940-1949	1950-1959	1960-1969	1970-1974
		(10,820)	(23,099)	(57,109)	(85,793)
Michigan	71.75	53.91	56.02	38.49	39.29
		(14,456)	(27,265)	(20,849)	(71,852)
Indiana	21.37	22.03	4.53	16.70	13.69
		(120,085)	(1,510,602)	(40,856)	(54,730)
Illinois	8.52	2.19	5.01	3.21	2.31
		(2,362,851)	(1,485,239)	(536,861)	(355,977)
Wisconsin	10.10	32.38	23.06	16.99	10.82
		(21,969)	(54,396)	(93,683)	(62,698)
Minnesota	0.07	1.07	7.26	0.88	0.88
		(3373)	(9382)	(40,395)	(79,401)
Iowa	0.22	0.22	0.46	1.42	0.08
		(29,810)	(45,934)	(198,568)	(343,787)
Missouri	0.70	0.48	0.06	0.36	0.05
		(94,976)	(275,648)	(957,653)	(357,960)
Arkansas	0.33	0.12	0.03	0.35	0.11
		(872)	(479,230)	(567,229)	(435,364)
Louisiana	7.57	2.33	0.68	1.22	0.09
		(21,116)	(28,422)	(3534)	(2086)
North Dakota	—	0.05	0.00	0.00	0.00
		(1978)	(1661)	(105,681)	(325)
South Dakota	0.21	0.003	0.01	0.00	0.00
		(340,275)	(484,167)	(527,907)	(367,643)
Nebraska	—	0.00	0.00	0.00	0.00
		(475)	(119,635)	(483,882)	(251,012)
Kansas	—	0.07	0.01	0.00	0.00
		(18,470)	(278,127)	(522,212)	(699,803)
Oklahoma	—	0.02	0.02	0.00	0.00
		(271,856)	(219,807)	(381,285)	(526,054)
Texas	0.85	0.01	0.01	0.02	0.03
		(371,425)	(780,751)	(610,126)	(222,464)

\*Calculated from Wing's (1943) summary, sample sizes not given.

appropriate data for the ten-year period 1965 to 1974, for the 41 states and provinces that were the subject of the earlier analyses. These figures have been incorporated into the earlier ones, and are presented in summary form (Table 1). To conserve tabular space, the actual numbers of each species have been replaced with an indication of total sample size, and the interested person may calculate approximate total numbers for each species on the basis of the indicated percentage of Black Ducks in the combined sample. Unfortunately, Wing (1943) did not provide actual sample sizes for his data, and in addition he presented the values in ratio rather than percentage form. Thus the significance of some unexpectedly high divergences in his figures for a few states (such as Virginia and Kentucky) from those for the following decade is uncertain, and might warrant a re-survey of the early data for these states.

A look at the tabulated data indicates that almost throughout its entire wintering range the Black Duck has suffered substantial reverses relative to Mallards, with only the extreme northeastern states and provinces still remaining essentially unaffected by this trend. Only a single state, Kentucky, presently exhibits a proportion of Black

Ducks that is more than one per cent higher than the figures presented by Wing for the period ending in 1939, and the data for this state exhibit some surprising fluctuations in Black Duck percentages that probably are the result of the occasional inclusion of counts from a few areas in which Mallards concentrate.

On the other hand, twelve states or provinces have undergone changes in which the 1970-1974 figures for the Black Duck have decreased from one to 20 per cent relative to the percentages shown for the earliest interval tabulated, and in 15 states and provinces the changes have been in excess of 30 per cent (Figure 1). Not surprisingly, the largest changes have occurred in the vicinity of the eastern Great Lakes and the southeastern Atlantic coast, which were the first areas affected by the eastern movement of Mallards, and have thus had time to change the greatest. Yet, even a few of the northeastern states are presently undergoing rapid change, particularly Maryland, Connecticut, Pennsylvania, and New Jersey which, when the data are plotted graphically, show an almost log-phase increase in Mallard percentages for the past few decades. The changes occurring in Massachusetts are less dramatic but still show a



recent acceleration of Mallard incursions, and observations in that state by Heusmann (1974) indicate that only the coastal-dwelling tendencies of Black Ducks help to mitigate extensive interspecies contacts with Mallards, which tend to concentrate on inland waters. This same ecological separation is evident in New York data which, when the primarily coastal counts from Long Island are removed, show that counts from the interior of the state exhibit a substantially greater Mallard influx. Heusmann's data from Massachusetts on the rate of hybridization parallel these trends, with the incidence of hybridization in inland sites almost 60 per cent higher than that estimated for the coast (12.9 per cent vs. 8.1 per cent of the combined population). Both of these percentages are higher than estimates published earlier by the senior author (Johnsgard, 1967), but the comparability of such data is made more difficult by the separation of actual hybrids from "pure" Black Duck variants that exhibit a few minor Mallard traits perhaps reflecting their evolutionary heritage rather than recent gene exchange.

#### SUMMARY

An analysis of Mallard and Black Duck data from Christmas Bird Counts from four provinces and 37 states during the period 1900-1974 pro-

vides a means of estimating the degree and rate at which Mallards have changed in abundance relative to Black Ducks as wintering birds in eastern North America. During that time the Black Duck has exhibited an apparent decrease relative to Mallards throughout its entire range, and only in the extreme northeastern end of its range has the contact between these two forms remained negligible. The changes which are now evident are indicative of a seemingly irrevocable trend in Mallard and Black Duck populations. It seems likely that the relatively specialized Black Duck, through increased competition and hybridization with the much more broadly adaptable Mallard, will continue to become an increasingly rarer component of the North America bird fauna.

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